CEP2005: Commercial Building Energy Specialist in HVAC and Controls Hybrid Online Training Course

Prerequisites

None

Recommended prior learning/experience

Familiarity with principles of basic HVAC design and operation. This course focuses on the energy efficiency aspects of this discipline, instead of attempting to cover covering any of the sub-topics.

Description

A maximally efficient HVAC system is vital to deliver a net-zero-energy commercial building. All new commercial buildings should strive for net-zero-energy, which is the lowest life-cycle cost building today. Configuring and operating the HVAC system to be lower capital cost and operate on a fraction of normal energy consumption is the key to this.

To actually achieve net-zero-energy cost-effectively requires good integrated design and making a series of decisions correctly through the design, installation, operation and optimisation of the energy-using equipment. HVAC is the most complicated area, and most likely to lock-in inefficient equipment. This course shows how to do this right.

This course details the process of delivering an optimally energy efficient HVAC system: sizing, design and operation, to cost-effectively provide excellent indoor air/environmental quality (IAQ/IEQ), comfort, health and productivity, while minimising HVAC energy consumption and costs.

Position and pathway

This course has an associated assessment which takes the form of an online examination. Success in the associated assessment is an element of CEP's Certified Professional in Energy and Certified Professional in Carbon professional qualifications.

To receive the qualification as a Certified Commercial Buildings Energy Specialist in HVAC and Controls, each applicant will submit a report on a project, relating to this course, preferably based on actual working experience. These are assessed according to a documented process, administered by CEP.

Delivery mode

This training course consists of twelve (12) lessons with a short exercise quiz at the end of each lesson, three (3) progression quizzes and completion quiz which acts as a practice for the separate online examination. Each lesson is available as an on-demand video, about 30 minutes long. This is followed by an exercise and short quiz (to let each attendee confirm comprehension - results supplied).

After each group of three lessons, there is a progression quiz with around 20 questions (results not supplied) again to confirm comprehension. Then there is a one-hour live on-line tutoring, question and discussion session, covering the material in those three lessons.

At the end of the course, there is a 100-minute, 100-point completion quiz, to be taken online as practice for the separate badge exam if you wish to complete that and work towards becoming Certified as a Commercial Building Energy Specialist in HVAC and Controls.

Course Hours

This course is split into twelve (12) lessons and approximately seven (7) hours of video viewing time plus four (4) one (1) hour live tutorials with the trainer. There will be a short exercise quiz (12) at the end of each lesson then students will be required to undertake three (3) progression quizzes, which should take around ten (10) minutes each. The total number of expected training course hours in total is eleven (11).

Learning outcomes

By the end of the training course, students should understand:

1. The basic principles of energy efficiency: setpoint resets, variable flow, low friction, optimised heat exchange, avoidance of reheat.
2. The basics and typical results of life-cycle cost optimisation.
3. The advantages of load reduction and integrated design.
4. The dependence of heating and cooling loads on outside temperature.
5. Energy-efficient aspects of HVAC design, control and equipment.

Course Structure and Progression

Lesson Outlines	
Lesson 1	**Overview of Energy Efficient HVAC Systems**
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • Three important, recurring patterns in energy efficiency. • Five basic principles of energy efficiency. • What is covered in the entire HVAC course.
Exercise Quiz 1	

Lesson 2	HVAC Systems Design
	Video duration: 36 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • Basic HVAC system patterns: circulating loops, driven by motorised machines, connected by heat exchangers. • Load calculations for sizing plant for peak-and part-loads. • The main methods for load reduction and its benefits. • Trade-offs including benefits of different air delivery system types.
Exercise Quiz 2	
Lesson 3	Cooling Plant Systems
	Video duration: 50 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • The fundamentals of refrigerant cycles. • Three main techniques to increase chiller efficiency. • Alternative (non-refrigerative) cooling techniques.
Exercise Quiz 3	
Progression Quiz 1	
Live Tutorial 1	Covering Lessons 1, 2 and 3
Lesson 4	Cooling Operations
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • Use OA optimisation to reduce cooling loads. • Apply resets and other operation strategies. • Stage different chillers for highest efficiency. • Measure cooling ΔT and what it means.
Exercise Quiz 4	
Lesson 5	Efficient Boiler Plant and Operations
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • Use electric / electrode boilers and heat pumps to supply heat, instead of combustion. • Efficient design of combustion boilers - maximising heat transfer (more tube passes).

	• Differences in design and operation of gas-fueled and solid-fueled boilers. • and air/fuel mixing are the keys to boiler efficiency. • Boiler efficiencies: measuring and improving them. • Necessary and cost-effective maintenance (especially boiler tuning).
Exercise Quiz 5	
Lesson 6	**Mechanical Systems Design**
	Video duration: 40 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • Fans have characteristic-shaped performance curves. • Ducts also have characteristic system performance curves. • Fan operation depends on where the fan curve intersects the system curve. • Reducing fan speed to reduce flow, instead of closing valves (increasing friction) saves significant power. • The operation of pumps, compressors and similar equipment follows the same patterns.
Exercise Quiz 6	
Progression Quiz 2	
Live Tutorial 2	**Covering Lessons 4, 5 and 6**
Lesson 7	**Indoor Air Quality**
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • The potential costs of sick building syndrome (SBS). • The amount of OA needed for good IAQ. • Problems with unusual pollution sources (indoor and outdoor), including infectious aerosols. • The costs and benefits of air filtration. • The principles of OA optimisation for IAQ and energy.
Exercise Quiz 7	
Lesson 8	**Data Centres and Server Rooms**
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 3, 5: • Useful data centre energy performance metrics.

	• Standard temperature/humidity requirements for data centres. • Principles of cool air management • Methods to reduce UPS losses. • The main energy saving techniques for data centres.
Exercise Quiz 8	
Lesson 9	**Motors and Drive Efficiency for HVAC Systems**
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 2, 3, 5: • Understand the causes of motors and drives inefficiencies. • Describe how to improve energy efficiency in motors and drives.
Exercise Quiz 9	
Progression Quiz 3	
Live Tutorial 3	**Covering Lessons 7, 8 and 9**
Lesson 10	**HVAC System Commissioning for Energy Efficiency**
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 2, 3, 4, 5: • The costs and cost-effectiveness of existing building commissioning. • The different types of commissioning processes. • Why so many faults occur in building HVAC systems. • How sensor errors can cause energy waste without being visible. • The results from several case studies, from repairing different types of problems.
Exercise Quiz 10	
Lesson 11	**Control Fundamentals**
	Video duration: 30 minutes approximately. Content relates to learning outcomes 1, 2, 4, 5: • The main Control types: on/off, P, PI, PID, etc. • The components and applications of BMS. • The basics of control logic. • "Trim and Respond" reset control logic.
Exercise Quiz 11	

Lesson 12	Control Diagnostics
	Video duration: 45 minutes approximately. Content relates to learning outcomes 1, 2, 4, 5: • Why building / HVAC energy analytics are needed. • The main HVAC patterns of operation as seen by the BMS. • The automated software available and its limitations. • The details of chiller / cooling tower operational optimisation.
Exercise Quiz 12	
Live Tutorial 4	**Covering Lessons 10, 11 and 12**
Completion Quiz	

Assessment

This training course has a separate formal assessment. A 100-minute, 100-point examination, to be taken online.

Completion

The course will be considered completed and a digital "Completion" certificate will be available when the student has achieved a score of 75% or above in the Completion Quiz.